

## Syllabus for Fall 2010

# CSE 456/556 Introduction to Visualization

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Fall 2010

08/30/ 2010—12/10/2010

TR 5:00pm-6:20pm

17 CLEMEN HALL

UB North Campus

Buffalo, NY

## Description for Catalog

Introduction to relevant topics and concepts in visualization, including computer graphics, visual data representation, physical and human vision models, numerical representation of knowledge and concept, animation techniques, pattern analysis, and computational methods. Tools and techniques for practical visualization. Elements of related fields including computer graphics, human perception, computer vision, imaging science, multimedia, human-computer interaction, computational science, and information theory. Covers examples from a variety of scientific, medical, interactive multimedia, and artistic applications. Hands-on exercises and projects.

**Prerequisites:** CSE250, basic programming skills, knowledge of fundamental data structures and algorithms

**Course Web:** [http://www.cse.buffalo.edu/~yunfu/course/CSE456,556\\_Fall2010.htm](http://www.cse.buffalo.edu/~yunfu/course/CSE456,556_Fall2010.htm)

## Course Topics and Tentative Schedule

Week	Date	Tuesday	Thursday	HW	Exam
1	Aug 31 & Sep 2	AVSS-- <b>No class</b>	Introduction		
2	Sep 7 & 9	Data Representation	Rosh Hashanah-- <b>No class</b>		
3	Sep 14 & 16	Image Model and Human Vision System	Visual Perception	HW 1	
4	Sep 21 & 23	Visual Cognition	Visualization Design 1		
5	Sep 28 & 30	Visualization Design 2	Color	HW 2	
6	Oct 5 & 7	Visualization Tools	Dimensionality Reduction( <b>TA</b> )		
7	Oct 12 & 14	Table and Graph	<b>Exam--No class</b>		Midterm
8	Oct 19 & 21	Trees and Networks	Interactive Visualization		
9	Oct 26 & 28	<b>Proposal Presentations</b>	Maps	HW 3	
10	Nov 2 & 4	Image-based Rendering	Face Image Computing( <b>TA</b> )		
11	Nov 9 & 11	<b>Paper Discussion</b>	Google Earth and GIS		
12	Nov 16 & 18	Medical Visualization	Artistic Visualization	HW 4	
13	Nov 23 & 25	Social Visualization	Fall Recess-- <b>No class</b>		
14	Nov 30 & Dec 2	Wrap Up	<b>Project Presentations</b>		
15	Dec 7 & 9	<b>Project Presentations</b>	<b>Final Proposal Due</b>		Final
16	Dec 14 & 16	Final Exams-- <b>No class</b>	Final Exams-- <b>No class</b>		

\* One or two guest lecturers will be invited to present some topics if funding is available for honoraria or expenses.

\* Courtesy of Prof. Hanspeter Pfister, Harvard University.

## Grading

Students will be graded on participation (at most two times absence), four homeworks, a mid-term examination, and a final project and presentation. The final grade will be composed as follows:

Class Participation.....	10%	Homework.....	30%
Mid-Term Exam.....	20%	Final Project.....	40%

## Final Project

The final project has two options: visualization demo design or software tool design. The basic idea of the two directions is the same which is to collect some scientific data and visualize them. The demo design mainly focuses on the visual animations, 2D/3D graphics, video making, and computer vision based visualization techniques. The tool design is mainly to design and implement a visualization tool that can analyze the data with any kind of visualization concepts or formats, summarize some useful results/conclusions, answer questions, and provide suggestions or comments. The data should be real data, which can be either collected by individual or borrowed from somewhere (with permission and acknowledgement). Students can use any API or programming language they like. Students can work on the project by themselves or team up with other students in the class. The team members cannot be more than two.

To grade the final project, three aspects will be considered. 1) proposal presentation (20%) on **Oct. 26**; 2) final project presentation (30%) on **Dec. 2 and 7**; 3) final project report and software package (50%) on **Dec. 9**. Late submission without instructor's permission may not be considered. Typically, we do not anticipate that the grades for each team member will be different. However, we reserve the right to assign different grades to each team member if the efforts or contributions they make are apparently different and unbalanced. Bonus points may be earned if the project shows significant novelty and large potentials for real-world applications. Those projects may get our guidance for further paper publications.

## Proposals and Reports

Please consider following contents when you prepare for your proposals and final reports:

- Project title
- Team members' names, affiliations and emails (one or two members)
- The project option you choose (demo or tool)
- Motivations of the project
- Real-world applications
- Data source and background (in detail)
- Tools and programming languages used in the project
- Contributions of the work (the work by the authors)
- Novelty of the work (optional)
- Visualization techniques (need to present details)
- Division of work for each team member
- Challenges and solutions
- Future work, extensions, improvements
- Additional comments
- References (including all papers, links, source codes, etc.)

## Submission

The presentation slides, the final report and software package should be submitted to [yunfu@buffalo.edu](mailto:yunfu@buffalo.edu) on time.

**Reference Books (Not required to purchase)**

Class lecture slides will be provided by the instructor for each student before each class, either printout or electronic file. Students will be asked to find more self-learning content from Internet resource. Recommended textbooks are:

1. The Visual Display of Quantitative Information (2nd edition), Edward Tufte, Graphics Press, ISBN 0961392142.
2. Visualizing Data, Ben Fry, O'Reilly (2007), ISBN: 0596514557.
3. Show Me the Numbers, by Stephen Few, Analytics Press, ISBN: 0970601999.
4. Data Visualization (principles and practice), Alexandru C. Telea., A K Peters, Ltd.
5. Information Visualization (perception for design) (2nd Edition), Colin Ware, Elsevier Press.

**Academic Honesty**

All the materials including methods, codes, tools, and words from existing sources should be acknowledged. Plagiarism, cheating, and other forms of academic dishonesty will result in serious consequences.